

REMARKS

The Office Action mailed February 21, 2007, and made final, has been carefully reviewed and the foregoing amendment has been made in consequence thereof.

Claims 1, 2, 4-6, 8-10, 12-15, 17, 19, 20, and 22-24 are now pending in this application. Claims 1, 2, 4-6, 8-10, 12-15, 17, 19, 20, and 22-24 stand rejected. Claims 3, 7, 11, 16, 18, 21, and 25 have been canceled.

The rejection of Claims 1, 2, 4-6, 8-10, 12-15, 17, 19, 20, and 22-24 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,052,398 to Gober (hereinafter referred to as "Gober") in view of U.S. Patent No. 6,501,979 to Manning et al. (hereinafter referred to as "Manning") is respectfully traversed.

Gober describes a system for real time heart imaging using a QRS filter. The filter includes a low-pass filter 42 and a high-pass filter 44 in series, and a gyroscan unit for generating images. The low-pass filter 42 attenuates portions of the QRS signal to produce a first output signal. "The low pass filter imposes a first given phase shift on the output signal relative to the input signal. A high pass filter responsive to the output signal applied as an input thereto attenuates those portions of the input signal applied thereto below the given range to produce a second output signal. The high pass filter imposes a second given phase shift relative to the time delay of the first output signal. The low and high pass filters are arranged so that the first and second phase shifts substantially cancel one another such that there is negligible time delay between the QRS signal applied to the low pass filter and the second output signal." (Col. 2, lines 11-18.) As such, "there is no discernable time delay introduced in the QRS signal outputted by filter 44 as compared to the QRS signal inputted to filter 42." (Col. 4, lines 3-9) The output of the low-pass filter 42 and the output of the high-pass filter 44 are received by an absolute value function filter 46, which rectifies phase differences between the output of the low-pass filter 42 and the output of the high-pass filter 44. The gyroscan unit triggers in response to the peaks from the filtered signals from filter 46 and generates the images. Notably, Gober does not describe nor suggest a method that includes introducing a time delay into a first ECG using a filter.

Manning describes a medical imaging method that includes receiving ECG signals and peripheral pulse (PPU) signals from a subject and generating reliable synchronization

signals to an imaging apparatus for triggering imaging data collection. The synchronization signals represent pre-determined phases of the heart and are based upon information derived from the ECG signals and the PPU signals. The PPU signals are described as being time delayed from the ECG signals based on a patient's physiology. Manning also describes verifying previously detected cardiac phases using current information from the determined phases and the current PPU. As such, detected PPU complexes and succeeding phases of a series of detected cardiac phases are used to indicate that a previously generated synchronization signal is associated with a non-physiologic cardiac phase. Notably, Manning does not describe nor suggest a method that includes introducing a time delay into a first ECG using a filter.

Claim 1 recites a method for generating an image of a heart at a selected cardiac phase, said method comprising "acquiring a first electrocardiogram (ECG) of the heart at a first phase; introducing a time delay into the first ECG using a filter; generating a phase-delayed ECG of the heart at the first phase using the time-delayed first ECG; determining if the phase-delayed ECG and the first ECG have the same approximate information; and generating an image of the heart if the phase-delayed ECG and the first ECG have the same approximate information."

Neither Gober nor Manning, considered alone or in combination, describes or suggests a method for generating an image of a heart at a selected cardiac phase as recited in Claim 1. More specifically, neither Gober nor Manning, considered alone or in combination, describes or suggests a method that includes introducing a time delay into a first ECG using a filter. Further, neither Gober nor Manning, considered alone or in combination, describes or suggests a method that includes generating a phase-delayed ECG of a heart at a first phase using a time-delayed first ECG. Rather, in contrast to the present invention, Gober describes a system for real time heart imaging using a low-pass filter and a high-pass filter coupled in series such that there is no discernable time delay introduced in the QRS signal outputted by the high-pass filter, and such that the high-pass filter imposes a phase shift to the output signal of the low-pass filter, and Manning describes a method of medical imaging that includes using a PPU pulse that is time delayed from an ECG signal based on a patient's physiology.

Accordingly, for at least the reasons set forth above, Claim 1 is submitted to be patentable over Gober in view of Manning.

Claims 2 and 4-6 depend, directly or indirectly, from independent Claim 1. When the recitations of Claims 2 and 4-6 are considered in combination with the recitations of Claim 1, Applicants submit that dependent Claims 2 and 4-6 likewise are patentable over Gober in view of Manning.

Claim 8 recites a method for generating an image of a heart at a selected cardiac phase using an MRI imaging system, said method comprising “acquiring a first electrocardiogram (ECG) of the heart at a first phase; introducing a time delay into the first ECG using a filter; generating a second electrocardiogram (ECG) of the heart at the first phase using the time-delayed first ECG; determining if the first ECG and the second ECG have the same approximate information; and generating an MRI image of the heart if the first ECG and the second ECG have the same approximate information.”

Neither Gober nor Manning, considered alone or in combination, describes or suggests a method for generating an image of a heart at a selected cardiac phase using an MRI imaging system as recited in Claim 8. More specifically, neither Gober nor Manning, considered alone or in combination, describes or suggests a method that includes introducing a time delay into a first ECG using a filter. Further, neither Gober nor Manning, considered alone or in combination, describes or suggests a method that includes generating a second electrocardiogram (ECG) of a heart at a first phase using a time-delayed first ECG. Rather, in contrast to the present invention, Gober describes a system for real time heart imaging using a low-pass filter and a high-pass filter coupled in series such that there is no discernable time delay introduced in the QRS signal outputted by the high-pass filter, and such that the high-pass filter imposes a phase shift to the output signal of the low-pass filter, and Manning describes a method of medical imaging that includes using a PPU pulse that is time delayed from an ECG signal based on a patient’s physiology.

Accordingly, for at least the reasons set forth above, Claim 8 is submitted to be patentable over Gober in view of Manning.

Claims 9 and 10 depend, directly or indirectly, from independent Claim 8. When the recitations of Claims 9 and 10 are considered in combination with the recitations of Claim 8, Applicants submit that dependent Claims 9 and 10 likewise are patentable over Gober in view of Manning.

Claim 12 recites a method for generating an image of a heart at a selected cardiac phase, said method comprising “acquiring a first electrocardiogram (ECG) of the heart at a first phase; introducing a time delay into the first ECG using a filter; generating a second electrocardiogram (ECG) of the heart at the first phase using the time-delayed first ECG; acquiring a first plethysmograph signal of the heart at a first phase; determining if the first ECG, the second ECG, and the plethysmograph signal have the same approximate information; and generating an MRI image of the heart if the first ECG, the second ECG, and the plethysmograph signal have the same approximate information.”

Neither Gober nor Manning, considered alone or in combination, describes or suggests a method for generating an image of a heart at a selected cardiac phase as recited in Claim 12. More specifically, neither Gober nor Manning, considered alone or in combination, describes or suggests method that includes introducing a time delay into a first ECG using a filter. Further, neither Gober nor Manning, considered alone or in combination, describes or suggests a method that includes generating a second electrocardiogram (ECG) of a heart at a first phase using a time-delayed first ECG. Rather, in contrast to the present invention, Gober describes a system for real time heart imaging using a low-pass filter and a high-pass filter coupled in series such that there is no discernable time delay introduced in the QRS signal outputted by the high-pass filter, and such that the high-pass filter imposes a phase shift to the output signal of the low-pass filter, and Manning describes a method of medical imaging that includes using a PPU pulse that is time delayed from an ECG signal based on a patient’s physiology.

Accordingly, for at least the reasons set forth above, Claim 12 is submitted to be patentable over Gober in view of Manning.

Claims 13-15 depend, directly or indirectly, from independent Claim 12. When the recitations of Claims 13-15 are considered in combination with the recitations of Claim 12, Applicants submit that dependent Claims 13-15 likewise are patentable over Gober in view of Manning.

Claim 17 recites a magnetic resonance imaging (MRI) system comprising “a radio frequency (RF) coil assembly for imaging a subject volume; and a computer coupled to said RF coil, said computer configured to: acquire a first electrocardiogram (ECG) of the heart at a first phase; introduce a time delay into the first ECG by filtering the first ECG; generate a

phase-delayed ECG of the heart at the first phase using the time-delayed first ECG; determine if the phase-delayed ECG and the first ECG have the same approximate information; and generate an image of the heart if the phase-delayed ECG and the first ECG have the same approximate information.”

Neither Gober nor Manning, considered alone or in combination, describes or suggests a magnetic resonance imaging system as recited in Claim 17. More specifically, neither Gober nor Manning, considered alone or in combination, describes or suggests a magnetic resonance imaging system that includes a computer configured to introduce a time delay into a first ECG by filtering the first ECG. Further, neither Gober nor Manning, considered alone or in combination, describes or suggests a magnetic resonance imaging system that includes a computer configured to generate a phase-delayed ECG of a heart at a first phase using a time-delayed first ECG. Rather, in contrast to the present invention, Gober describes a system for real time heart imaging using a low-pass filter and a high-pass filter coupled in series such that there is no discernable time delay introduced in the QRS signal outputted by the high-pass filter, and such that the high-pass filter imposes a phase shift to the output signal of the low-pass filter, and Manning describes a method of medical imaging that includes using a PPU pulse that is time delayed from an ECG signal based on a patient’s physiology.

Accordingly, for at least the reasons set forth above, Claim 17 is submitted to be patentable over Gober in view of Manning.

Claims 19 and 20 depend from independent Claim 17. When the recitations of Claims 19 and 20 are considered in combination with the recitations of Claim 17, Applicants submit that dependent Claims 19 and 20 likewise are patentable over Gober in view of Manning.

Claim 22 recites a computer program embodied on a computer readable medium for controlling a medical imaging system, said program configured to “acquire a first electrocardiogram (ECG) of the heart at a first phase; introduce a time delay into the first ECG using a filter; generate a second electrocardiogram (ECG) of the heart at the first phase using the time-delayed first ECG; determine if the first ECG and the second ECG have the same approximate information; and generate an MRI image of the heart if the first ECG and the second ECG have the same approximate information.”

Neither Gober nor Manning, considered alone or in combination, describes or suggests a computer program embodied on a computer readable medium for controlling a medical imaging system as recited in Claim 22. More specifically, neither Gober nor Manning, considered alone or in combination, describes or suggests a computer program configured to introduce a time delay into a first ECG using a filter. Further, neither Gober nor Manning, considered alone or in combination, describes or suggests a computer program configured to generate a second electrocardiogram (ECG) of a heart at a first phase using a time-delayed first ECG. Rather, in contrast to the present invention, Gober describes a system for real time heart imaging using a low-pass filter and a high-pass filter coupled in series such that there is no discernable time delay introduced in the QRS signal outputted by the high-pass filter, and such that the high-pass filter imposes a phase shift to the output signal of the low-pass filter, and Manning describes a method of medical imaging that includes using a PPU pulse that is time delayed from an ECG signal based on a patient's physiology.

Accordingly, for at least the reasons set forth above, Claim 22 is submitted to be patentable over Gober in view of Manning.

Claims 23 and 24 depend from independent Claim 22. When the recitations of Claims 23 and 24 are considered in combination with the recitations of Claim 22, Applicants submit that dependent Claims 23 and 24 likewise are patentable over Gober in view of Manning.

In addition, Applicants respectfully submit that the Section 103 rejection of Claims 1, 2, 4-6, 8-10, 12-15, 17, 19, 20, and 22-24 is not a proper rejection. Obviousness cannot be established by merely suggesting that it would have been obvious to one of ordinary skill in the art to modify the system for real time heart imaging of Gober with the medical imaging method of Manning to arrive at the present invention. As explained by the Federal Circuit, “to establish obviousness based on a combination of the elements disclosed in the prior art, there must be some motivation, suggestion or teaching of the desirability of making the specific combination that was made by the Applicant.” In re Kotzab, 54 USPQ2d 1308, 1316 (Fed. Cir. 2000); MPEP 2143.01.

Furthermore, as is well established, the mere fact that the prior art structure could be modified does not make such a modification obvious unless the prior art suggests the

desirability of doing so. See In re Gordon, 221 USPQ2d 1125 (Fed. Cir. 1984). The Federal Circuit has determined that:

[i]t is impermissible to use the claimed invention as an instruction manual or “template” to piece together the teachings of the prior art so that the claimed invention is rendered obvious. This court has previously stated that “[o]ne cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.

In re Fritch, 23 USPQ2d 1780, 1784 (Fed. Cir. 1992). Further, under Section 103, “it is impermissible . . . to pick and choose from any one reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art.” In re Wesslau, 147 USPQ 391, 393 (CCPA 1965). Rather, some suggestion to combine such references and a reasonable expectation of success must both be found in the prior art, and not based on Applicants’ disclosure. In re Vaeck, 20 USPQ2d 1436 (Fed. Cir. 1991). In the present case, neither a suggestion nor motivation to combine the cited art, nor any reasonable expectation of success has been shown, either explicitly or implicitly.

Specifically, there is no suggestion or motivation explicitly or implicitly within Gober and/or Manning to combine Manning with Gober to produce the claimed invention. Accordingly, since there is neither a teaching nor a suggestion in the cited art for the claimed combination, the Section 103 rejection appears to be based on a hindsight reconstruction in which isolated disclosures have been picked and chosen in an attempt to deprecate the present invention. Of course, such a combination is impermissible, and for this reason alone, Applicants respectfully request that the Section 103 rejection of Claims 1, 2, 4-6, 8-10, 12-15, 17, 19, 20, and 22-24 be withdrawn.

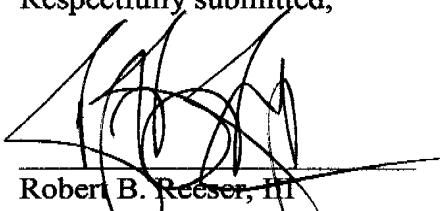
Moreover, if art “teaches away” from a claimed invention, such a teaching supports the nonobviousness of the invention. U.S. v. Adams, 148 USPQ 479 (1966); Gillette Co. v. S.C. Johnson & Son, Inc., 16 USPQ2d 1923, 1927 (Fed. Cir. 1990). In light of this standard, it is respectfully submitted that the cited art, as a whole, is not suggestive of the presently claimed invention. Applicants respectfully submit that Gober teaches away from the present invention. Specifically, Gober is directed to a system for real time heart imaging using a QRS filter that requires low and high pass filters that are arranged so the first and second phase shifts substantially cancel one another such that *there is a negligible time delay*

between the QRS signal applied to the low pass filter and the second output signal. Gober describes that the cancellation of the first phase shift by the second phase shift *introduces no discernable time delay* to the outputted QRS signal. Manning is directed to a medical imaging method that includes a PPU pulse that is time delayed from an ECG signal based on a patient's physiology. As such, neither Gober nor Manning, considered alone or in combination, describes nor teaches a method that includes *introducing a time delay* into the first ECG using a filter. (Emphasis added.) Accordingly, Applicants respectfully submit that the cited art as a whole teaches away from the method for generating an image of a heart at a selected cardiac phase as recited.

For at least the reasons set forth above, Applicants respectfully request the Section 103 rejection of Claims 1, 2, 4-6, 8-10, 12-15, 17, 19, 20, and 22-24 be withdrawn.

In view of the foregoing amendment and remarks, all the claims now active in this application are believed to be in condition for allowance. Reconsideration and favorable action is respectfully solicited.

Respectfully submitted,



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